Amendments to the Claims

1.(previously amended) A memory system, comprising:

a hard disk;

a cache memory, wherein the cache memory is comprised of a non-volatile ferroelectric memory;

a memory controller, operable to:

determine if a memory request received by the memory system can be satisfied by accessing the cache memory;

queue up the memory request if the memory request cannot be satisfied by the cache memory; and

execute the memory request queued up when the hard disk is accessed.

2.(original) The system of claim 1, wherein the cache memory further comprises a polymer ferroelectric memory.

3.(original) The system of claim 1, wherein the memory controller further comprises a digital signal processor.

4.(original) The system of claim 1, wherein the memory controller further comprises an application specific integrated circuit.

5.(original) The system of claim 1, wherein the memory controller further comprises software running on a host processor.

6.(original) The system of claim 1, wherein the memory controller resides coincident with the cache memory.

7.(original) The system of claim 1, wherein the memory controller resides separately from both the cache memory and the hard disk.

8.(previously amended) A method of processing memory requests, the method comprising:

receiving a request for a memory operation;

determining if data for the memory operation exists in a ferroelectric cache memory;

if the data does not exist in the ferroelectric cache memory:

accessing a hard disk that contains the data for the request; and

performing any queued up disk memory operations.

9.(previously amended) The method of claim 8, wherein the memory operation is a read operation.

10.(previously amended) The method of claim 8, wherein accessing a hard disk further comprises spinning up the hard disk.

11.(previously amended) The method of claim 10, the method further comprising spinning down the hard disk after performing any queued up disk memory operations.

12.(previously amended) The method of claim 8, wherein if the data does not exist in the ferroelectric cache memory, the method further comprising:

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determining if the request is part of a sequential stream;

if request is part of a sequential stream, deallocating cache lines in the cache memory and prefetching new cache lines;

if request is not part of a sequential stream, determine if prefetch is desirable; and

if prefetch is desirable, prefetch data.

13. (previously amended) The method of claim 12, wherein the prefetch is queued up as a disk memory operation.

14. (previously amended) The method of claim 8, wherein performing any queued up disk memory operations further comprises determining if the queued up disk memory operations are desirable and then performing the queued up disk memory operations that are desirable.

15. (previously amended) The method of claim 8, wherein the memory operation is a write operation.

16. (previously amended) The method of claim 8, further comprising writing data into the cache if the data exists in the ferroelectric cache memory.

17. (previously amended) The method of claim 16, further comprising queuing up a disk memory operation and transferring the data to the disk from the ferroelectric cache memory after the accessing the hard disk.

18. (previously amended) The method of claim 8, wherein the queued up disk memory operations are periodically reviewed to ensure their continued desirability.

19. (previously amended) The method of claim 8, further comprising performing a disk memory operation if the data does not exist in the ferroelectric cache memory and wherein the disk memory operation further comprises writing data to the disk.

20. (previously amended) The method of claim 8, wherein the queued up disk memory operations include writing data from the ferroelectric cache memory to the hard disk.

21. (previously amended) A method of performing a read memory operation, the method comprising:

receiving a read request;

determining if data to satisfy the read request is located in a ferroelectric cache;

satisfying the read request from data in the ferroelectric cache, if the data is located in the ferroelectric cache;

C1 if the data is not located in the ferroelectric cache, performing a disk read operation, wherein the disk read operation comprises:

accessing a disk;

allocating a new cache line;

transferring data from the disk to the new cache line; and

satisfying the read request.

22. (previously amended) The method of claim 21, wherein accessing a disk further comprises spinning up a hard disk.

23. (previously amended) The method of claim 22, wherein the method further comprises spinning down the hard disk after satisfying the request.

24. (previously amended) The method of claim 21, wherein the disk read operation further comprises:

determining if the data transferred from the disk to the new cache line is part of a sequential stream;

if the data is part of a sequential stream, prefetching new cache lines;

if the data is not part of a sequential stream, determining if prefetch is desirable; and

if prefetching is desirable, performing a prefetch.

25. (previously amended) The method of claim 24, wherein prefetching further comprises queuing up a prefetch operation to be executed during a next disk memory operation.

26. (previously amended) A method of performing a write memory request, the method comprising:

receiving a write request;

determining if at least one line in a ferroelectric cache is associated with the write request;

if at least one line in the ferroelectric cache is associated with the write request, performing a cache write to the line; and

if no lines in the ferroelectric cache are associated with the write request, performing a new write operation.

27. (previously amended) The method of claim 26, wherein the new write operation further comprises:

allocating a new cache line;

writing data from the write request to the line allocated; and

queuing up a disk write operation, wherein the disk write operation will transfer the new data from the ferroelectric cache to a disk in a later disk memory operation.

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28. (previously amended) An apparatus comprising:

a non-volatile polymer ferroelectric cache memory coupled to a storage device.

29. (previously amended) The apparatus of claim 28 further comprising a controller coupled to the non-volatile polymer ferroelectric cache to queue a memory request and wherein the storage device includes a part capable of moving.

30. (previously amended) The apparatus of claim 29 wherein the controller queues the memory request while the part is not moving.

31. (previously amended) The apparatus of claim 29 wherein the controller is adapted to queue the memory request while the part is not moving.

32. (previously amended) The apparatus of claim 29 wherein the controller comprises software.

33. (previously amended) The apparatus of claim 32 wherein the apparatus further comprises a general-purpose processor coupled to the non-volatile polymer ferroelectric cache memory, and the software comprises a driver for execution by the general-purpose processor.

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34. (previously amended) The apparatus of claim 28 wherein the apparatus comprises a system selected from the group comprising a personal computer, a server, a workstation, a router, a switch, and a network appliance, a handheld computer, an instant messaging device, a pager and a mobile telephone.

35. (previously amended) The apparatus of claim 30 wherein the controller comprises a hardware controller device.

36. (previously amended) The apparatus of claim 28 wherein the storage device comprises a rotating storage device.

37. (previously amended) The apparatus of claim 36 wherein the rotating storage device comprises a hard disk drive.

Claim 38 and 39(cancelled)

40.(previously amended) An apparatus comprising:

a rotating storage device;

a non-volatile ferroelectric cache memory coupled to the rotating storage device; and

a controller coupled to the cache memory and capable of :

queuing first access requests directed to the rotating storage device;

spinning up the rotating storage device in response to second access requests; and

completing the queued first access requests after the rotating storage device is spun up.

41. (previously amended) The apparatus of claim 40 wherein the first access requests comprise write requests.

42. (previously amended) The apparatus of claim 41 wherein the second access requests comprise read requests.

43. (previously amended) The apparatus of claim 42 wherein the read requests comprise read requests for which there is a miss by the non-volatile ferroelectric cache memory.

44. (previously amended) The apparatus of claim 41 wherein the first access requests further comprise prefetches.

45. (previously amended) The apparatus of claim 44 wherein the read requests comprise read requests for which there is a miss by the non-volatile ferroelectric cache memory.

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46. (previously amended) A method of operating a system which includes a rotating storage device, the method comprising:

spinning down the rotating storage device;

receiving a first access request directed to the storage device;

queuing up the first access request using a ferroelectric memory;

receiving a second access request directed to the storage device;

in response to receiving the second access request, spinning up the rotating storage device; and

servicing the second access request.

47.(previously amended) The method of claim 46 further comprising:

servicing the first access request.

48.(previously amended) The method of claim 47 wherein the second access request comprises a read request that misses the cache.

49. (previously amended) The method of claim 47 wherein the servicing of the first access request is performed after the servicing of the second access request.

50. (previously amended) The method of claim 49 wherein the second access request comprises a read request.

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51. (previously amended) The method of claim 50 queuing up the first access request comprises recording the first access request in the cache.

52.(previously added) A method, comprising:

writing data from a non-volatile cache memory to store in a disk memory in response to a cache read miss.

53.(previously added) The method of claim 52, further comprising reviewing the data in the non-volatile cache memory to determine if the data is desirable to store in the disk memory.

54.(previously added) The method of claim 52, wherein the writing comprises writing the data from a non-volatile polymer ferroelectric cache memory to the disk memory in response to the cache read miss.

55.(currently amended) A method, comprising:

writing data from a polymer ~~ferroelectric~~ cache memory to a disk memory.

56.(currently amended) The method of claim 55, wherein the writing comprises writing the data from the polymer ~~ferroelectric~~ cache memory to the disk memory in response to cache read miss and after receiving a write request.

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57.(currently amended) The method of claim 55, further comprises:

receiving at least two write requests prior to the writing; and

writing data associated with the at least two write requests to the disk memory from the polymer ~~ferroelectric~~ cache memory after a cache read miss.

58.(previously added) A method, comprising:

receiving at least two write requests to write data to a disk memory; and

writing the data associated with the at least two write requests to the disk memory in response to a cache read miss.

59.(currently amended) The method of claim 58, further comprising:

storing the data associated with the at least two write requests in a non-volatile polymer ~~ferroelectric~~ cache memory prior to the writing.

60.(previously added) The method of claim 59, wherein the at least two write requests are received when the disk memory is spun down, and further comprising spinning up the disk memory in response to the cache read miss.

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61.(previously added) A method, comprising:

queuing all write requests to write data to a disk memory using a non-volatile memory if the disk memory is spun down.

62.(currently amended) The method of claim 61, wherein queuing comprises queuing all the write requests using a non-volatile polymer ~~ferroelectric~~ cache memory if the disk memory is spun down.

63.(previously added) The method of claim 61, further comprising:

spinning up the disk memory in response to a cache read miss; and

writing the data associated with all the write requests to the disk memory after the cache read miss.

64.(previously added) A method, comprising:

spinning up a disk memory only in response to a cache read miss.

65.(currently amended) The method of claim 64, further comprising transferring data from a polymer ~~ferroelectric~~ cache memory to the disk memory in response to the cache read miss.

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66.(currently amended) A method, comprising:

prefetching data from a disk memory to a polymer ~~ferroelectric~~ memory.

67.(currently amended) The method of claim 66, wherein the prefetching includes prefetching the data from the disk memory to a polymer ~~ferroelectric~~ cache memory only in response to a cache read miss.

68.(previously added) The method of claim 67, further comprising spinning up the disk memory in response to the cache read miss prior to the prefetching.

69.(previously added) The method of claim 66, further comprising queuing prefetches if the disk memory is spun down.

70.(previously added) A method, comprising:

caching data associated with a multimedia sequential stream in a ferroelectric memory.

71.(previously added) The method of claim 70, wherein the data is stored in a disk memory prior to the caching, and wherein the caching comprises transferring the data from the disk memory to the ferroelectric memory.

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72.(previously added) The method of claim 71, wherein the transferring includes transferring the data from the disk memory to the ferroelectric memory in response to a cache read miss.

73.(new) A memory system, comprising:

a hard disk;

a cache memory, wherein the cache memory is a non-volatile polymer memory;

a memory controller, operable to:

determine if a memory request received by the memory system can be satisfied by accessing the cache memory;

queue up the memory request if the memory request cannot be satisfied by the cache memory; and

execute the memory request queued up when the hard disk is accessed.

74.(new) The memory system of claim 73, wherein the cache memory is a non-volatile polymer ferroelectric cache memory.

75.(new) A method, comprising:

determining if data to satisfy a read request is located in ~~the~~ a polymer cache memory;

satisfying the read request from data in the polymer cache, if the data is located in the polymer cache memory;

if the data is not located in the polymer cache memory, performing a disk read operation, wherein the disk read operation comprises:

accessing a disk;

allocating a new cache line;

transferring data from the disk to the new cache line; and

satisfying the read request.

76. (new) The method of claim 75, wherein accessing a disk further comprises spinning up a hard disk and wherein the method further comprises spinning down the hard disk after satisfying the request.

77.(new) The method of claim 58, further comprising:

storing the data associated with the at least two write requests in a non-volatile ferroelectric cache memory prior to the writing.

78.(new) The method of claim 61, wherein queuing comprises queuing all the write requests using a non-volatile ferroelectric cache memory if the disk memory is spun down.

79.(new) The method of claim 64, further comprising transferring data from a ferroelectric cache memory to the disk memory in response to the cache read miss.

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80.(new) An apparatus, comprising:

a non-volatile cache memory to cache data for a hard disk, wherein the non-volatile cache memory is a polymer memory.

81.(new) The apparatus of claim 80, further comprising a controller coupled to the non-volatile cache memory to queue a memory request while the hard disk is not spinning.

82.(new) The apparatus of claim 80, wherein the non-volatile cache memory is a polymer ferroelectric memory.

83.(new) The apparatus of claim 80, wherein the non-volatile cache memory includes at least one layer of polymer material between at least two electrodes.

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84.(new) The apparatus of claim 83, wherein the polymer material is a polymer material having ferroelectric properties.